# Leverage, ownership structure, and product market competition: evidence from listed companies in China

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# 論文摘要

本文主要研究資本結構、國有股權與企業產品市場行爲之間的關係，並嘗試解釋高負債企業在經濟下行時期市場佔有率下降的狀況。在 Campello and Fluck(2006)的基礎上，我們構建了一個由具有不同資本結構的企業，具有產品偏好及轉換成本的消費者，以及國有股東所組成的模型，以刻畫面對負向市場衝擊時中國企業的市場行爲。繼而提出四個假說。

採用 2007-08 年中國上市公司的季度數據，進一步的經驗分析顯示：（1）當宏觀經濟環境趨惡時，高負債企業較其同行業競爭者會喪失更多的市場份額；（2）債務比例與企業市場份額的負相關性，在低杠桿行業中更爲顯著；（3）國有股權能有效減輕負債對市場份額的負面影響；（4）當國有股比例低於 50%時，其對企業的支持作用隨控股比例增大而增大；但當國有股比例高於 50%時，這種關係並不顯著。

# Abstract

This paper studies the implication of financial structures and state ownership on firms' product market behavior. We develop a theoretical model in which two firms with different debt level, consumers facing switching cost and the state shareholder operate together, to determine the product price and market share of each company. We present four theoretical predictions on the interaction between financial structure, state ownership, and firm's product market performance.

Consistent with these predictions, using data of Chinese listed firms over the 2007-08 recession, we provide evidence that the firm with higher leverage than industry peers tends to loss larger market shares when there is a negative shock to the economy. We also find that the negative effect of debt burden is stronger for firms that operate in industries with low debt level. Additionally, we show that for state-owned firms the market share losses during recession is less significant than a private firm with similar leverage level. Finally, we show that when the proportion of state shares is lower than 50%, its benefit increases, while when the proportion of state shares exceeds 50%, state ownership is less helpful in preventing leveraged firm from losing market share during recession.

# Chapter 1 Introduction

Modigliani and Miller (1958) propose that in the absence of taxes, bankruptcy costs, and asymmetric information, and in an efficient market, the value of a firm is unaffected by how that firm is financed. Modigliani-Miller's capital structure irrelevance principle has been challenged by a lot of literature demonstrating how financial structure choice impact companies' incentive to produce and invest.[1] Starting with the work on agency cost by Jensen & Meckling (1976) and Myers (1977), most of the attention has been devoted to show how the capital structure introduces conflicts of interests among investors (e.g., shareholders versus bondholders) and between investors and managers.[2] And high leverage emerges as a way of mitigating incentive problems through reducing the free cash flow available for spending at the discretion of managers (Jensen, 1986). These literatures, however, take the firm as unit of analysis and ignore the interaction between product market competition and a firm's financing decisions. When faced with such competition, firms may use financial leverage strategically to affect a rival's behavior and thus alter the competitive outcome.

Although some recent contributions have attempt to explore the implication of financial structures on firms' product market behavior, the characteristics of the interaction between firm's financial structure and real business performance has remained an ambiguous issue. First, conflicting view exists as to whether leverage has positive or negative impact on firm's competitiveness. Second, researchers have

[1] See Allen & Winton (1995)
[2] See Harris and Raviv (1991) and Myers (2002) for review of the literature.

questioned the direction of causality between product market competition and financial structure. Third, almost all of the literature focuses on firms in developed countries, while the features of Chinese firms largely remain unknown.

This paper focuses on these three questions and tries to empirically examine how a firm's financial structure and ownership structure influences its behavior in the product market as well as other industry peers, thereby influencing the competitive outcome.

We investigate the product market competition to shed light on the mechanism through which financing decisions and ownership structure influence real corporate performance. We propose and test a theory of product market competition in which firms face capital market imperfections and consumers face switching costs. In our model, there are two firms producing similar products with different brands. They operate to maximize the total profits in a two-stage game, while the profit is jointly determined by market share and sale price. Consumers have various tastes and face switching cost when they change the brand in case of bankruptcy of previous supplier. We assume that consumers are rational individuals who take into account the price of products, their preference, and the switching cost when they choose a brand. The two companies are also rational agents that if they expect high bankruptcy probability in the second stage, they will charge high price to maximize the profit in the first state; otherwise they may lower the price so that the increased market share will benefit them in the second period. The probability of bankruptcy is determined by the economy, the capital structure of both companies, and the state

ownership. We summarize the predictions of the model into three hypotheses:

***Hypothesis 1:*** *The firm with higher leverage than industry peers tends to loss larger market shares when there is a negative shock to the economy.*

***Hypothesis 2:*** *When there is a negative shock to the economy the firm with higher leverage than industry peers tends to loss larger market shares if it operates in an industry with low debt level.*

***Hypothesis 3a:*** *The state ownership of companies has a positive contribution to the firm performance when they adopt higher degrees of leverage than industry average.*

***Hypothesis 3b:*** *The effect increases with the growth of state ownership ratio.*

Our empirical tests are conducted during the 2007-08 recession period, where the exogenous, economy-wide market shifts make the financial constraints more binding and thus alter the behavior of firms, rivals, consumers and government. Our main focus is on the market share growth sensitivity to the company's financial leverage relative to industry peers in condition of negative demand shock. The main empirical results are as follows. First, the pre-existing debt burden has negative effect on firm's market share growth during recession, and the magnitude of this effect is determined by the industry characteristics. Specifically, if the company operates in an industry where low leverage is prevailing, it will be impacted more seriously by the debt burden. On contrary, if the company operates in a high leveraged industry, the negative impact of debt burden becomes not so significant. Second, we also examine the extent to which the state shareholder influences the interaction between firm

financing and product market outcome. Generally speaking, state ownership mitigates the leverage effect. The market share growth of state-owned leveraged firms exceeds those without or with less state shareholding. However, this benefit disappears when government becomes the majority shareholder (with more than 50% shares).

Our paper adds to the theoretical literature on the interaction of financial leverage and product market performance. The innovation of this paper is to introduce state shareholder into the traditional framework composed of consumers, company, and industry rival. As far as we know, none of the existing literatures have analyzed these factors simultaneously. The empirical evidence of this paper adds to previous literature by showing the consistent results using Chinese data. Further, our paper is the first attempt to exam the beneficial effect of state ownership for high leverage companies during recession.

The remainder of the paper is organized as follows. In Chapter 2, we review the literature on capital structure and product market performance. In Chapter 3, we develop a model analyzing the impact of financial constraints and ownership structure on the cyclicality of market shares. In Chapter4, we focus on one specific event window: the 2007-08 recession. The detailed tests of this chapter address the first and second hypothesis of our model prediction. In Chapter 5, we explore the special characteristics of Chinese firms-- the state ownership. Literature and stories are reviewed and proposed in this chapter. And the tests verify our third hypothesis.

# Chapter 2 Literature Review

## 2.1 Theoretical review

In this section, I will briefly summarize the theories related to the interaction between firm's financial structure and product market performance.

On one hand, the argument that high leverage has positive impact on firms' product market performance is developed from the "strategic commitment" theory of Brander and Lewis (1986). They build a model of Cournot (quantity) duopoly competition and show that when debt has limited liability (Equity holders receive the residual beyond the fixed debt obligation in good states and losses are bounded by the value of salvageable assets in bankruptcy states), Cournot firms subject to some output market uncertainty will use debt to show the commitment to large output stances in an attempt to gain a strategic advantage and thus the low levered firms will reduce their output to avoid loss. As a result low leveraged firms will behave less aggressively and high leveraged firms should experience market share gains.

Other papers have also made important contribution to this approach. Showalter (1995) considers Bertrand (price) competition, and demonstrates that the strategic debt choice depends on the type of uncertainty in the product market. Under cost uncertainty firms avoid debt, since it causes prices and profits to fall. Under demand uncertainty, however, firms use strategic debt to keep prices and profits high.

On the other hand, a contrary view exists that high leverage level will negatively affect firms' product market performance. There are two explanations supporting this

argument. First, the initial level of debt may negatively affect performance because highly indebted firms may be unable to finance large new investments (Myers, 1977). This debt overhang might force leveraged firms to pass up profitable growth opportunities and, in the most extreme cases, even force them out of the market. As Myers (1977) points out, this problem is more likely to arise when investments cannot be collateralized easily.

Second, the level of debt may negatively affect performance because it directly affects a firm's ability to compete. For example, Telser (1966) suggests that dependence on outside financing can result in financial fragility and thus a high leveraged firm is more vulnerable to unconstrained rivals' competition. The basic story suggests that "long purse" – accessibility to financial reserves—allows companies to pose a credible threat of "predatory pricing" strategy to existing competitors and to potential entrants. And this strategy only works if the high leveraged firms can not raise fund and reduce their leverage. Bolton and Scharfstein (1990) further formalized this argument by presenting a model in which predators could take advantage of high leveraged firms' need to refinancing by making them appear unprofitable, thereby adversely affects the agency relationship between the rival's investors and manager and motivating their investors to cut off funding. A basic result from this line of research is that the firms that have lower leverage will perform aggressive, while the high leveraged firms will behave passively and even suffer from the cutthroat competition.

## 2.2 Empirical review

In support of "strategic commitment" theory, Showalter (1999) empirically examine the strategic use of debt. In a test of all manufacturing firms operating for at least 11 years over the 20 year period 1975–1994, he find firms hold more debt as demand uncertainty rises, and use less leverage as costs become less certain.

On the side of "long purse" theory, although it has received much attention, it is the recent work by Chevalier (1995a, b), Kovenock and Phillips (1995, 1997), and Campello and Fluck (2006) that provides the first empirical evidence on this issue. Chevalier (1995a) examines the change of industry pricing following a wave of leveraged buyout (LBO) of supermarkets in 1980's. She finds that supermarkets that have increased leverage through a LBO tend to face a greater threat of price competition by financially unconstrained rivals. Consistent with Chevalier's finding, by examines the association between financial structure and industry output in four industries in which the largest firms used leveraged recapitalization to increase debt ratios by at least twenty five percent, Phillips (1995) finds that most firms that increased leverage experienced sales decreases, market share lose or did not increase their market share when other firms exist the industry.

Although the literature has devoted a great deal of attention to the analysis of the implications of firm's financial structure choice on product market competition, a common element of most of the existing literature is that the firms studied have increased their leverage substantially, through a recent LBO or recapitalization. This approach may suffer from two econometric problems. First, we can not tell it is the

firms' capital structure that affects market performance or rather foresighted manager adjusts capital structure according to potential product market outcomes. Second, the empirical link between capital structure and competitive performance may be only the spurious causality that both the capital structure and firm's performance are influenced by other unobserved factors such as industry concentration, excess capacity, and growth (see Kovenock and Phillips, 1997; and Zingales, 1998).

My study therefore designs an alternative test for the theory. Instead of measure firm's performance after capital structure changes, I look at the sensitivity of firm's performance to pre-existing financial leverage following macro-environment shock that is exogenous to firm's capital structure choice.

# Chapter 3 The model

The model we present below predicts the impact of capital structure on firm's market share over business cycle. Of the existing literature, our model is closest in spirit to Campello and Fluck (2006) in which the cyclicality of firm's market share due to financial constraints varies depending on the capital structure of the firm itself and of the firm's rivals. However, our model differs from Campello and Fluck (2006) in that we not only model the impact of capital market imperfection on firms, creditors and consumers, but also we further introduce the state as an equity holder. In our model, rival firms produce different brands of the same product and face capital market imperfections when raising external finance. These firms compete for consumers who differ in their preferences and for whom switching brands (across producers) is potentially costly. In such an environment, there is a trade-off between short- and long-term profit maximization. Producers can maximize profits in the long run by charging lower prices at first (to build up market shares), subsequently raising prices to profit from locked-in costumers. Such investment in market share is profitable in the long run, but it is costly in the short run. The incentive to favor long-term profit maximization at the expense of short-term results may depend on the firms' ability to survive in the long term. When consumers choose a brand, they understand that capital market frictions may drive their supplier out of business and take into account the welfare loss that firm bankruptcy imposes upon them. The state will have no action if the firm can serve the debt by itself, but it may exempt the firm's debt in case the firm faces the risk of bankruptcy.

## 3.1 Story and structure

In our story there are two firms A and B, who produce similar goods for the same customers and compete in periods 1 and period 2. There are two states of nature in the first period, the good state H and the bad state L. The total demand for the product is $\theta^H$ in state H and $\theta^L$ in state L ( $\theta^H > \theta^L$ ). The probability of state H is $\mu$ and the expected demand for the industry in the first period is $\overline{\theta} = \mu\theta^H + (1-\mu)\theta^L$ . The demand in second period is normalized to 1.

Suppose firms A and B are located at the two endpoints of the line segment [0,1]. Consumers are uniformly distributed over the same interval and have a per-unit reservation price $R$ for the good. Each consumer incurs a cost $ty$ when purchasing goods from A and $t(1-y)$ when buying from B, where $y$ and $(1-y)$ stands for the distance of preference of consumer $y$ to firms A and B, respectively, and $t$ is the per-unit utility cost associated with that distance. The distant cost is used to stand for consumer's preference for goods produced by different firms. For example, suppose there is a consumer 0 who is located at the same endpoint as firm A, then his cost of buying goods from A equals to 0 ( $t \times 0$ ) and the cost of purchasing from B equals to $t$ ( $t \times (1-0)$ ), which means firm A's product is his ideal product.

The profits of A and B in period 2 will be

$$\pi_2^A = (R - c_2)\sigma_1^A$$

$$\pi_2^B = (R - c_2)\sigma_1^B$$

Where $R$ is the per-unit reservation price of consumer, $c_2$ is the marginal cost

for both firms in the second period, and $\sigma_1^A$ and $\sigma_1^B$ are A's and B's market shares built in period 1.

A consumer may have to switch to a different brand in the second period if his supplier is liquidated in the first period. The consumer will take this into account when he decides whether to buy from firm A or B in period 1. He chooses to buy from firm A rather than firm B in the first period if

$$p^A + ty + (1-\mu)\beta^A s \le p^B + t(1-y) + (1-\mu)\beta^B s \qquad (1)$$

where $\beta^A$ is the probability that firm A is liquidated in the first period and $s$ is the switching cost when consumer has to switch to a different brand in the second period. The probability of liquidation in the first period ($\beta^A$ and $\beta^B$) is determined by the natural state and the financial status of firm A and B in that period.

Notice from (1) that when deciding which brand to choose consumers take into account the prices competitors charge, the disutility of consuming a particular brand as opposed to the consumer's ideal choice, the likelihood of each firm being liquidated after the first period, and the costs of switching to a different brand after habits are formed. The lower the price a supplier charges the larger market share it gets in the first period. If the probability of liquidation is the same for both firms, then this probability does not affect consumer's choice. If, for example, the probability of liquidation for firm A exceeds that of firm B and the switching costs are high enough, then more consumers might choose to stay away from A in the first period.

## 3.2 Two-period model development

In the first period, each firm takes into account that their pricing decisions will have an impact on their market shares and profits both in the first and second period. From (1) we could get

$$y \le \frac{1}{2} + \frac{p^B - p^A + (1-\mu)(\beta^B - \beta^A)s}{2t} \qquad y \in [0,1]$$

which stands for all the consumers who will purchase goods from firm A. Thus given each firm's price, the likelihood of the natural state, and the likelihood of bankruptcy and consumer's switching cost, we could derive the market share of firm A and B in the first period

$$\sigma_1^A = \frac{1}{2} + \frac{p^B - p^A + (1-\mu)(\beta^B - \beta^A)s}{2t} = 1 - \sigma_1^B \qquad (2)$$

In the following analysis, we consider three scenario: the benchmark case in which both A and B are internally financed,

### 3.2.1 Benchmark case, Scenario 1: both A and B are internally financed

In this scenario, the probability of liquidation of the unleveraged firms in the first period is zero ( $\beta^A = \beta^B = 0$ ). Each firm sets its price to maximize the total profit in two periods

Firm A: $\underset{p^A}{Max}[(p^A - c_1)\bar{\theta}\sigma_1^A + (R - c_2)\sigma_1^A] \qquad (3)$

In which $\sigma_1^A = \frac{p^B - p^A}{2t} + \frac{1}{2}$

Firm B: $\underset{p^B}{Max}[(p^B - c_1)\bar{\theta}\sigma_1^B + (R - c_2)\sigma_1^B]$

In which $\sigma_1^B = 1 - \sigma_1^A = \frac{p^A - p^B}{2t} + \frac{1}{2}$

From the first order condition of firm A's and B's profit-maximizing decision, we obtain

$$\bar{\theta} p^B - 2\bar{\theta} p^A + (t + c_1)\bar{\theta} - (R - c_2) = 0$$

$$\bar{\theta} p^A - 2\bar{\theta} p^B + (t + c_1)\bar{\theta} - (R - c_2) = 0$$

Set $p^A = p^B$, we have

$$p^A = p^B = t + c_1 - \frac{R - c_2}{\bar{\theta}} \quad (4)$$

$$\sigma_1^A = \sigma_1^B = \frac{1}{2} \quad (5)$$

Compared with the result of one-period game in a market of perfect competition, the first period equilibrium price in this scenario is lower[3] . It is because that firm profits more in the second period if it can capture a larger consumer base in the first period. With internal financing, A and B will split the market equally.

### 3.2.2 Scenario 2: both firm A and B are externally financed

We now consider the alternative scenario in which firms may not fully fund their

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[3] Firm A: $\underset{p^A}{Max}(p^A - c_1)\bar{\theta}\sigma_1^A$, in which $\sigma_1^A = \frac{p^B - p^A}{2t} + \frac{1}{2}$

Firm B: $\underset{p^B}{Max}(p^B - c_1)\bar{\theta}\sigma_1^B$, in which $\sigma_1^B = 1 - \sigma_1^A = \frac{p^A - p^B}{2t} + \frac{1}{2}$

The equilibrium price $p^A = p^B = t + c_1$

operations internally, but instead need to raise $I$ externally. We assume that a financially constrained firm can only pay off its debt in the high demand state H. Formally, $(p_1^A - c_1)\theta^L \sigma_1^A < D \leq (p_1^A - c_1)\theta^H \sigma_1^A$, where D is the face value of the first period debt. In the event of default in first period, the creditors will liquidate the firm's asset. If the assets have not been seized in the first period, the creditors cannot enforce any payment from the manager in the second period and manager will divert all of $\pi_2^A$ to himself.

From the perspective of firm's manager, if he pays off the debt in period 1 and continues operation in period 2, the total income is $\pi_1^A - D + \pi_2^A$; if he defaults on the debt and the creditors liquidate the firm's asset in the first period, the total income is $\pi_1^A$. If $\pi_1^A > \pi_1^A - D + \pi_2^A$, the manager will break the contract in the first period. As a result, the incentive compatible condition is $\pi_2^A \geq D$ (in which $\pi_2^A = (R - c_2)\sigma_1^A$).

If the firm has to liquidate its asset, it will sell them to the highest value alternative user ( Shleifer and Vishny, 1992). We assume that if the buyer is an industry outsider, the assets are sold as scrap. Thus the company will always sell its assets to an industry competitor. Since the creditors can not enforce any payment from borrowers in the second period, they will not finance the asset acquisition in that period, which means the only fund that could be used to purchase the liquidated assets comes from first period's income. Suppose firm A liquidates its assets in first period, then the maximum amount firm B is willing and able to afford should be the smaller of $(R - c_2)\sigma_1^A$ and $(p_1^B - c_1)\theta^H \sigma_1^B - D$. So we can use $\lambda(R - c_2)\sigma_1^A$ to

denote of the liquidation value of firm A's asset ( $\lambda \in [0,1]$ ). If $\lambda = 1$, the assets are liquidated at the firm's continuation value $(R - c_2)\sigma_1^A$. We also assume that $\lambda(R - c_2)\sigma_1^A \le D$, so there is nothing left after paying back the debt, and the manager will never receive a positive profit in liquidation.

In the scenario of two leveraged firms, the probability of liquidation in the first period is greater than zero ( $\beta^A = \beta^B > 0$ ).Each firm sets its price to maximize the total profit in two periods. Take firm A as an example, in good state the manager will pay off debt and continue operation in the second period, because according to the incentive compatible condition, $\pi_1^A - D + \pi_2^A \ge \pi_1^A$. Thus in good state the manager will maximize $\theta^H \sigma_1^A (p_1^A - c_1) - D + (R - c_2)\sigma_1^A$. In bad state, however, the manager does not have the ability to pay off the debt because $(p_1^A - c_1)\theta^L \sigma_1^A < D$. Thus his goal is to maximize $(p_1^A - c_1)\theta^L \sigma_1^A$ in the first period and then quit the business. On the other hand, in good state the creditor receive face value $D$, while in bad state the creditor have to liquidate the assets and receive $\lambda(R - c_2)\sigma_1^A$. Thus the breakeven condition is $\mu D + (1-\mu)\lambda(R - c_2)\sigma_1^A - I = 0$. Formally, we have

Firm A: $\underset{p^A}{Max}\ \mu[\theta^H \sigma_1^A (p_1^A - c_1) - D + (R - c_2)\sigma_1^A] + (1-\mu)[\theta^L \sigma_1^A (p_1^A - c_1)]$

Which equals to

$$\underset{p^A}{Max}\ \bar{\theta}\sigma_1^A (p_1^A - c_1) - \mu D + \mu(R - c_2)\sigma_1^A$$

In which $\sigma_1^A = \dfrac{p^B - p^A}{2t} + \dfrac{1}{2} = 1 - \sigma_1^B$

Firm B: $\underset{p^A}{Max}\ \bar{\theta}\sigma_1^B (p_1^B - c_1) - \mu D + \mu(R - c_2)\sigma_1^B$

In which $\sigma_1^B = 1 - \sigma_1^A$

Solve for the first order condition and set $p^A = p^B$, we obtain

$$p^A = p^B = t + c_1 - \frac{\mu(R - c_2)}{\bar{\theta}}$$

$$\sigma_1^A = \sigma_1^B = \frac{1}{2}$$

Because a leveraged firm is less likely to operate in the second period, it will benefit less from building market share and will in turn charge higher prices in the first period. We notice that the equilibrium price is higher than the price in the unleveraged scenario. The price level in the industry increases by $\frac{(1-\mu)(R-c_2)}{\bar{\theta}}$ as both firms take on leverage.

### 3.2.3 Scenario 3: firm A is leveraged but firm B is not

Because firm A is unable to pay off its debt in the bad state, the liquidation probability $\beta^A = 1$. For the unleveraged firm B, the liquidation probability $\beta^B = 0$.

Firm A: $\underset{p^A}{Max}\, \bar{\theta}\sigma_1^A(p_1^A - c_1) - \mu D + \mu(R - c_2)\sigma_1^A$

In which $\sigma_1^A = \frac{p^B - p^A - (1-\mu)s}{2t} + \frac{1}{2} = 1 - \sigma_1^B$

Taking the first order condition for firm A, we get A's reaction function

$$p_1^A = \frac{t + c_1 + p_1^B - (1-\mu)s}{2} - \frac{\mu(R - c_2)}{2\bar{\theta}} \qquad (6)$$

In contrast, taking $p_1^A$ as given, firm B's manager will choose $p_1^B$ to maximize the profit.

Firm B: $\underset{p^B}{Max}[(p^B - c_1)\bar{\theta}\sigma_1^B + (R - c_2)\sigma_1^B]$

In which $\sigma_1^B = \frac{p^A - p^B + (1-\mu)s}{2t} + \frac{1}{2}$

Taking the first order condition for firm B, we get B's reaction function

$$p_1^B = \frac{t + c_1 + p_1^A + (1-\mu)s}{2} - \frac{(R - c_2)}{2\bar{\theta}} \qquad (9)$$

Substitute $p_1^B$ into (6) and $p_1^A$ back into (9) we get

$$p_1^A = t + c_1 - \frac{(1-\mu)s}{3} - \frac{(1+2\mu)(R-c_2)}{3\bar{\theta}}$$

$$p_1^B = t + c_1 + \frac{(1-\mu)s}{3} - \frac{(2+\mu)(R-c_2)}{3\bar{\theta}}$$

The comparison above reveals a very interesting result of our analysis: the leveraged firm A offers a discount of $\frac{(1-\mu)s}{3}$ to compensate its consumers for the possible welfare losses should their supplier be liquidated in the downturn. In contrast, the unleveraged firm B charges a premium of $\frac{(1-\mu)s}{3}$ because its consumers do not have to switch to another brand in bad state.

Using $p_1^A$ and $p_1^B$ we get the market shares of firm A and B, respectively

$$\sigma_1^A = \frac{1}{2} - \frac{(1-\mu)s}{6t} - \frac{(1-\mu)(R-c_2)}{6t\bar{\theta}}$$

$$\sigma_1^B = \frac{1}{2} + \frac{(1-\mu)s}{6t} + \frac{(1-\mu)(R-c_2)}{6t\bar{\theta}}$$

### 3.2.4 Scenario 4, the most complicated case: firm A is leveraged but firm B is not, firm A is state-owned enterprise or group affiliated

In previous scenarios, we assume that the leveraged firm A will definitely be liquidated if bad state occurs. However it is not necessarily the case in reality.

A very common feature of Chinese companies is the state shareholding. Tian (2001) documents a very interesting phenomenon that the statistic relationship between state shareholding and corporate value follows a U-shape patter. That is to

say, when the government is a small shareholder, firms are valued lower when the shareholding stake of the government is higher, but, after a certain threshold, corporate value increases with larger size of state shareholding stakes. Tian attributes the phenomenon to that the government shareholder gradually turns from a grabbing hand to be a helping hand.

In our theory, we also expect that the government shareholder could bring beneficial effect to the leveraged firm A. We follow the intuition that the state-owned enterprises which are regarded as members of "national teams" in national and local economic development in the PRC (Nolan, 2001), enjoyed governmental support and provision of strategic critical resources, such as the access to bank, loans, capital, and opportunities of being listed in stock markets. As a result, companies with the dominant state ownership could have the ability to continue operating in the second period even if it can not pay off the debt in the first period.

Formally, we assume that in bad state the state-owned financial constrained firm A only needs to pay back $\gamma D$ for the debt and the creditors (most of the time it is a state-owned bank) will exempt the rest. The value of $\gamma$ rages from 0 to 1, which depends on the relation between the company and the state. As a result, the probability of liquidation $\beta^A$ equals to $\gamma$. Take two extremely cases for example, in the first case $\gamma$ equals to 0, firm A pays nothing to the creditors and the default probability is 0; in the second case $\gamma$ equals to 1, firm A have to pay back all the face value of debt and the default probability is 1, the same as in the scenario 3.

In good state, firm A acts like an independent company and uses its revenue in

the first period to pay back all the debt. The goal of the manager is to maximize $\mu[\theta^H \sigma_1^A (p_1^A - c_1) - D + (R - c_2)\sigma_1^A]$. In bad state, firm A can not pay back all the debt by itself. Thus it will turn for help of the government and try to obtain the exemption. The target of the manager changes to maximize $(1-\mu)[\theta^L \sigma_1^A (p_1^A - c_1) - \gamma D + (R - c_2)\sigma_1^A]$, $\gamma \in (0,1)$. Combining the two states together, we arrive at the object function of firm A.

Firm A: $\underset{p^A}{Max}\, \bar{\theta}\sigma_1^A (p_1^A - c_1) - \mu D - \gamma(1-\mu)D + (R - c_2)\sigma_1^A$

In which $\sigma_1^A = \dfrac{p^B - p^A + (1-\mu)(\beta^B - \beta^A)s}{2t} + \dfrac{1}{2} = \dfrac{p^B - p^A - \gamma(1-\mu)s}{2t} = 1 - \sigma_1^B$

Taking the first order condition for firm A, we get A's reaction function

$$p_1^A = \frac{t + c_1 + p_1^B - \gamma(1-\mu)s}{2} - \frac{(R - c_2)}{2\bar{\theta}}$$

In contrast, taking $p_1^A$ as given, the unleveraged firm B's manager will choose $p_1^B$ to maximize the profit.

Firm B: $\underset{p^B}{Max}[(p^B - c_1)\bar{\theta}\sigma_1^B + (R - c_2)\sigma_1^B]$

In which $\sigma_1^B = \dfrac{p^A - p^B + \gamma(1-\mu)s}{2t} + \dfrac{1}{2}$

Taking the first order condition for firm B, we get B's reaction function

$$p_1^B = \frac{t + c_1 + p_1^A + \gamma(1-\mu)s}{2} - \frac{(R - c_2)}{2\bar{\theta}}$$

Substitute $p_1^B$ into (6) and $p_1^A$ back into (9) we get

$$p_1^A = t + c_1 - \frac{\gamma(1-\mu)s}{3} - \frac{(R - c_2)}{\bar{\theta}}$$

$$p_1^B = t + c_1 + \frac{\gamma(1-\mu)s}{3} - \frac{(R - c_2)}{\bar{\theta}}$$

Using $p_1^A$ and $p_1^B$ we get the market shares of firm A and B, respectively

$$\sigma_1^A = \frac{1}{2} - \frac{\gamma(1-\mu)s}{6t}$$

$$\sigma_1^B = \frac{1}{2} + \frac{\gamma(1-\mu)s}{6t}$$

It is very interesting that with the increase of government support ($\gamma \to 0$), the market share of leveraged firm A approaches $\frac{1}{2}$, while with little government support ($\gamma \to 1$), the leveraged firm A still faces the risk of liquidation and it has little incentive to maintain the market share. Firm A's market share loss $\frac{\gamma(1-\mu)s}{6t}$ is a function of its relation with the government.

## 3.3 Empirical implications

In this part we derive three testable implications of the effect of leverage on firm's market share in business cycle.

***Hypothesis 1:*** *The firm with higher leverage than industry peers tends to loss larger market shares when there is a negative shock to the economy.*

The economic intuition of this hypothesis is that facing negative shock, the default probability of the leveraged firm in the second period increases. Recall that we assume a leveraged firm can not pay back its debt in bad state. Thus the manager of a financially constrained firm tends to be short-sighted and he does not have the incentive to build market share in the first period. Since the probability $(1-\mu)$ stands for the likelihood of the appearance of bad state, it is nature that the increase of $(1-\mu)$ represents the increase of the probability that the bad state will occur.

Formally, in scenario 3 where firm A is leveraged but firm B is not, we

differentiate the leveraged firm's market share $\sigma_1^A$ and unleveraged firm's market share $\sigma_1^B$ with respect to $(1-\mu)$, respectively

$$\frac{\partial \sigma_1^A}{\partial(1-\mu)} = -\frac{(R-c_2)}{6t\bar{\theta}} - \frac{(1-\mu)(R-c_2)(\theta^H-\theta^L)}{6t\bar{\theta}^2} - \frac{s}{6t} < 0$$

$$\frac{\partial \sigma_1^B}{\partial(1-\mu)} = \frac{(R-c_2)}{6t\bar{\theta}} + \frac{(1-\mu)(R-c_2)(\theta^H-\theta^L)}{6t\bar{\theta}^2} + \frac{s}{6t} > 0$$

The first order condition supports our economic intuition that within an industry, a negative shock will lead to market share losses by the more leveraged firm while lead to market share gains by the less leveraged (unleveraged) firm. In the empirical part, we use an exogenous, negative shock to the macroeconomic environment as instruments for increase in $(1-\mu)$.

***Hypothesis 2:*** *When there is a negative shock to the economy the firm with higher leverage than industry peers tends to loss larger market shares if it operates in an industry with low debt level.*

We use $\sigma_1^{A,LU}$ to denote the market share of leveraged firm A in an industry with one leveraged firm and one unleveraged firm (Scenario 3). Because the rival is unleveraged, we call this a "low-leverage industry". We use $\sigma_1^{A,LL}$ to denote the market share of leveraged firm A in an industry composed of two leveraged firm (scenario 2). We call this a "high-leverage industry". Our purpose is to formally derive the extent of market share loss of firm A in different scenario when there is a negative shock.

If firm A operates in "low-leverage industry"

$$\frac{\partial \sigma_1^A}{\partial(1-\mu)} = -\frac{(R-c_2)}{6t\bar{\theta}} - \frac{(1-\mu)(R-c_2)(\theta^H-\theta^L)}{6t\bar{\theta}^2} - \frac{s}{6t} < 0$$

If firm A operates in "high-leverage industry",

$$\frac{\partial \sigma_1^A}{\partial(1-\mu)} = 0$$

The implication is consistent with our intuition. In a high-leverage industry, all the companies will focus on short-term profit during the recession. As a result, the high-debt company A could retain its market share. In contrast, in a low-debt industry, because the unleveraged firm B will continue operation in the second period and has the incentive to increase its market share in the first period, the high-debt company A is likely to experience market share losses. In the empirical part, we rank industries according to the industry leverage level and test whether the cyclicality of market share of leveraged firms varies across industries.

***Hypothesis 3a:*** *The state ownership of companies has a positive contribution to the firm performance when they adopt higher degrees of leverage than industry average.*

***Hypothesis 3b:*** *The contribution increases with the growth of state shareholding ratio.*

We use $\sigma_1^{A,P}$ to denote the market share of private-owned leveraged firm A in an industry with one leveraged firm and one unleveraged firm (Scenario 3). We use $\sigma_1^{A,S}$ to denote the market share of state-owned leveraged firm A in an industry with one leveraged firm and one unleveraged firm (Scenario 4).

The difference between $\sigma_1^{A,S}$ and $\sigma_1^{A,P}$ is

$$\frac{\partial \sigma_1^{A,S}}{\partial(1-\mu)} - \frac{\partial \sigma_1^{A,P}}{\partial(1-\mu)} = \frac{(1-\gamma)s}{6t} + \frac{(R-c_2)}{6t\bar{\theta}} > 0, \qquad \gamma \in (0,1)$$

To see the *hypothesis 3b* formally, denote by $\gamma_j$ and $\gamma_k$ ($\gamma_k < \gamma_j$) the "payment ratio" faced by firm $A_j$ and $A_k$, respectively. Both firm $A_j$ and $A_k$ are leveraged firms in low-debt industry. Our model implies that:

$$\frac{\partial \sigma_1^{A_j,S}}{\partial(1-\mu)} - \frac{\partial \sigma_1^{A_k,S}}{\partial(1-\mu)} = \frac{(1-\gamma_j)s}{6t} - \frac{(1-\gamma_k)s}{6t} = \frac{(\gamma_k - \gamma_j)s}{6t} < 0$$

Where $\sigma_1^{A_j,S}$ and $\sigma_1^{A_k,S}$ denote the market shares of the leveraged firm $A_j$ and $A_k$ in low-debt industry.

The implication is that in a low leveraged industry, if a company has government background, it will gain more market share than the private-owned peers in condition of negative shocks. The higher the government ownership, the better a leveraged firm will perform during recession. The economic intuition behind this hypothesis may be that, because of the implicit government guarantee, managers are no longer afraid of bankruptcy. As a result, they have the incentive to build up market share in early stage.

# Chapter 4 Evidence on Product Market Competition

## 4.1 Background: The 2007-08 Recession

One approach to minimize the endogeneity of capital structures is to measure the company's market performance following exogenous shocks which change the macro-environment as well as the company's competitiveness under an existing financial structure (Zingales, 1998; Campello and Fluck, 2006). Using Campello and Fluck's criteria, we identify a suitable event window for the test. [4]

The "natural experiment" provided by the 2007-08 recession helps solve the endogenous problem of capital structure choice, and allows us to direct test the impact of pre-event financial structure on the within-event product market performance.

First, the macro-environment shock brought about an unexpected change to the market environment. From 90's firms had experienced a golden period of expansion, but beginning in 2007 they suddenly faced tight monetary policy and sharp decline in the demand. Figure 1 shows the 3-year lending rate and deposits rate from 2000 to 2009. In order to control the inflation rate, the People's Bank of China began to employ contractionary policies and these rates rise sharply from the second quarter of 2007 until the third quarter of 2008. We notice that during 2007-08 these rates reach the highest point since 2000. As Figure 2 shows, due to the global economic slowdown this period is also characterized by a sharp decline of industry activity. The year-to-year GDP growth rate slumped since the fourth quarter of 2007 and has

[4] First, the event should be an exogenous, real-side shock. Second, the event should allow for unanticipated effects of financial structure. Third, it should not be industry-specific, but affect a large cross-section of industries at the same time. For more details, see Campello and Fluck (2003).

not yet recovered until the last quarter of 2008, which is in line with our argument of "2007-08 recession". The suddenly changed economic situation provides an exogenous, real-side shock to the competitive environment; as a result the capital structure should not have been pre-determined in anticipation of this shock.

Second, because the global financial market suffered from the credit crunch at the same time, it is difficult for companies to issue new shares on the stock market or renegotiate contracts with creditors. For example, in 2008 the CSRC temporarily suspended the IPO on A-share market. The nature of the event-window makes it unlikely that companies could quickly adjust their capital structure to the negative shock.

Third, the 2007-08 recession is not an industry specific event, but affects all firms in the market. Thus we are able to study the relation between a firm's market performance and its industry-adjusted financial structure across various industries.

In this section, we argue that the endogenous problem will be lessened against the background of the exogenous shock in both demand and credit. According to the theory, we should expect to observe those firms respond differently to the shock depending on their pre-existing financial structure and on the leverage of their rivals.

## 4.2 Data and Variables

### 4.2.1 Sample selection

We begin our sample selection process by identify a set of firms that have been listed on A-share and B-share before 2007/01/01. We eliminate the duplicate sample

which is listed on A-share and B-share at the same time. Firms that have been delisted or suspended listing are discarded. This procedure has two benefits. First, it helps ensure that our sample firms' capital structure is pre-determined before the 2007-2008 event period. And second, because almost all of the delisted and suspended listing companies are accompanied by extremely high leverage ratio and poor market performance, the exclusion of these companies makes our result more credible.

Our source of data is the CSMAR database and the quarterly financial report of each company. We gather quarterly firm-level data on total asset, total debt, gross sales, and PPE (plant, property and equipment) for the 2006: IV-2008: III period. Firms with negative equity are discarded. Consistent with previous literature, we classify industries according to CSRC's industry classification standard. Because the estimation below uses industry-adjusted data, only industries with a minimum of ten firms are kept in the sample. This process generates a final sample consisting of 1175 firms in 35 industries.

### 4.2.2 Variable definition

A. Firm performance

The dependent variable, firm performance, is represented as a firm's relative-to-industry sales performance. Traditionally empirical literatures tend to use pricing behavior (markup) to reflect how a firm's financial structure affects its competitive behavior (see, e.g., Chevalier, 1995b; Phillips, 1995; Chevalier and

Scharfstein, 1996). This measure, however, is inappropriate for our purpose because our goal is to measure how the financial structure affects the product market outcome, and the pricing behavior is only one of a number of strategies that could be employed to affect product market outcome. Instead, we use the firm's relative-to-industry sales changes to gauge its performance in the product market. Specifically, the firm's relative-to-industry sales changes during 2007-2008 recession is defined as the quarterly sales growth rate from 2007: IV-2008: III, adjusted for industry sales-weighted mean, so that this variable measures the firm's sales growth relative to that of its competitors. One shortage of this proxy is that it directly measures the competition result and we can not tell the particular mechanism that contributing to it.

$$\Delta Log(Sales)_{i,t} = [Log(Sales)_{2008:III} - Log(Sales)_{2007:IV}]/3 - industry\ mean$$

B. Leverage

The most important independent variable, debt obligations of the firm relative to their industry peers, is measured by the industry-adjusted ratio of total debt to total assets. Several alternative forms of leverage were used in other studies, including long term debt to book value of asset and total debt to market value of the firm ( Rajan and Zingales, 1995; Booth et al., 2001; Fama and French, 2002). This measure is suitable for our study for at least two reasons. First, it is difficult to distinguish the long-term and short-term liability in China because many companies extend the short term liability continuously and utilize the short-term credit in the long-term. And second, because nearly two-thirds shares of Chinese listed firms are

non-tradable shares, the market value of listed companies can not capture the true value of the whole company.

This variable is defined as the difference between the ratio of the book value of total debt to total asset of a sample firm in 2007: IV (the quarter before the recession starts), and the industry-specific asset-weighted mean.

C. Size

We control for the size effect in the estimation. Warner (1977) and Ang et al. (1982) theorize that bankruptcy costs relative to assets decline and thus the advantage of debt financing grows as firms get larger. Additionally, large firms are less prone to bankruptcy than small firms because they generally are more diversified and have less volatile income streams relative to small firms. As a result, costs of debt are relatively lower for large firms, and large firms therefore will carry more debt relative to assets than small firms. Further, larger assets imply a higher borrowing capacity. Without controlling for it, the leverage coefficient may be biased. (Campello and Fluck, 2006). The size of the firm is given as the log of average total assets (SIZE), the same proxy used by Ferri and Jones (1979) and Friend and Lang (1988).

D. PPE

If the manager is optimistic, he will increase the fixed investment and the production capability. Thus we should expect a positive relationship between the log change of fixed asset and firm's market share. In addition, As noted by Jensen and Meckling (1976) as well as Myers (1977), shareholders have an incentive to invest

sub-optimally to expropriate wealth from the firm's bondholders unless the debt is collateralized. As the collateralizable fixed assets rise, the moral hazard is mitigated and the cost of debt financing falls. As a result, the amount of fixed asset may be positively related to the leverage.

The proxy for change in fixed assets is the log change of gross property, plant, and equipment.

### 4.2.3 Summary statistics

We report the summary statistics of the sample firm in Table 1. The observation of our samples is evenly distributed among 35 industries, in which the manufacturing companies (the industry code starts with "C") account for 62% of the whole sample. The single industry's leverage varies from a low of 39 percent in beverage to a high of 72 percent in architecture. The mean leverage is equal to 56% which indicates that the firms in our sample, on average, have a debt level below the medium of the G-7 countries (Rajan and Zingales, 1995). Consistent with the negative shock, we notice that during the 2007: IV to 2008: III period, the average quarterly sales growth rate for sample firms is -1%. We also notice that about 68 percent of the sample firms experience a negative sales growth during the recession period.

## 4.3 Empirical results

### 4.3.1 Methodology

The baseline model we use focuses on the sensitivity of sales growth to leverage,

after controlling for fixed asset investment and firm size.

$$\Delta Log(Sales)_{i,t} = \eta + \sum_{k=1}^{4} \alpha_k \Delta Log(Assets)_{i,t-k} + \sum_{k=1}^{4} \beta_k \Delta Log(PPE)_{i,t-k} + \delta Leverage_{i,t-1} + \varepsilon_{i,t}$$

The left-hand side dependent variables are measured *within* the recession period while the right-hand side variables are calculated *before* the recession. The dependent variable is the average quarterly change in sales over the 2007: IV- 2008: III recession period, which is computed as the difference between the log of sales in 2008: III and the log of sales in 2007: IV, divided by three. We adjust all the dependent variable for industry-specific sales weighted means, so it reflects the firm's market performance relative to its industry peers. All observations of the independent variable are also adjusted according to the industry means. For example, the leverage is adjusted based on industry-specific asset weighted average leverage.

We first estimate the baseline model using pooled data from the 2007-08 period to examine the sensitivity of firm's market performance to its debt burden facing exogenous negative shock (Hypothesis 1). We then examine whether the sensitivity varies among industries presenting different leverage level (Hypothesis 2). Specifically, we rank industries according to the asset-weighted leverage in 2007: IV (the quarter before the recession period). Next, based on the average leverage ranking we divide the sample into three parts, the "low-debt", "medium-debt" and "high-debt". Then we estimate the baseline model for each subsample.

### 4.3.2 Results

The estimation in Table 2 examines whether firm's market performance is

sensitive to its pre-existing financing decisions. I simply pool firms in all industry together and regress industry-adjusted sales changes on leverage after controlling for fixed asset investment and firm size. In the first regression (column 1, Table 2), all the control variables are included and a negative and statistically significant coefficient -0.056 for leverage is returned. The estimates suggest that the sales of a firm with a leverage ratio 10 percent above its industry average before the recession is expected to grow nearly 0.6 percent less than its rivals in each quarter during the recession period. The result is consistent with our first hypothesis and similar to Campello and Fluck (2006), in which the US data during 1990-91 recession is employed and returns a -0.0373 coefficient for leverage.

However, of great interest is the variation of the performance-leverage relation across industries with different debt level. Although the 2007-08 recession provides an exogenous shock to the market and thus enable us to examine company's performance under existing financial structures, we can not rule out the possibility that some firm-specific characteristics could influence both a firm's financial decision before the recession starts and its sales performance during the recession. Fortunately, the theory provides a method to address the concern. Our model predicts that the sensitivity of a firm's market performance to its debt level will change according to the financial status of its rivals. Thus when we divide the sample into several subsamples based on industry debt level, the coefficient for leverage should be different across subsamples, and if the observed negative coefficient for leverage is attributed to certain unobservable firm characteristics, the coefficient for leverage

should be constant across subsamples.

Table 3 compares the estimation of firm's sales-debt sensitivity in industries where rivals are less leveraged with those in industries where rivals are more leveraged. We first rank the sample industries according to industry asset-weighted leverage in 2007: IV, the quarter before the recession starts. Next, we divide the sample industries into deciles and estimate the baseline model separately for firms competing in low-leverage industries and in high-leverage industries. Our focus is to compare the differences in sales-leverage sensitivities of firms in industries with different leverage level. In the first set of estimation, we define firms in industries whose leverage level is ranked in the lowest decile of all the industries as "low-leverage group", those in the highest leverage decile as "high-leverage group", and the remaining firms as "medium-leverage group". Interestingly, we notice that when we move from low-leverage group to high-leverage group, the coefficient for leverage increases from -0.1219 in low-leverage group to -0.0492 in medium-leverage group and -0.0296 in high-leverage group, and the coefficient even become non-significant in high-leverage group ( Column 2-4, Table 3). The results implies that, suppose there are two high-leveraged firms operating in low-leverage group and high-leveraged group respectively, both firms' leverage ratios are 1 percent higher than industry means, then when suffering from negative exogenous shocks, the quarterly sales growth rate of the firm in low-leverage group is 10 percent lower than the one in high-leverage group. The result we obtained is consistent with Campello and Fluck (2006) again, in which the estimated sensitivity

of sales to leverage changes from significantly negative (-0.08) to slightly positive (0.01) as one moves from low- to high-leveraged industries.

One possible explanation of the positive relation between sales-leverage sensitivity and industry leverage level may be that the low-leverage industry tends to be an industry with high business risk and firms in more cycle-sensitive industries are more likely to choose lower debt ratio. Hence, those firms carrying excess debt burden in the low-leverage industry suffer more from the declining demand than firms operating in high-leverage industry.

Overall, these results suggest that during the year of recession, firms with higher leverage underperform their industry peers (Hypothesis 1). And the debt-burden hurt firm's market performance more severely when the firm is operating in a low-leverage industry (Hypothesis 2).Both of these findings are consistent with the prediction of our theory.

## 4.4 Robustness test

### 4.4.1 Different industry leverage ranking cut-offs

In previous section we divide the sample into three subsamples according to industry leverage level to test the *hypothesis 2*. And our finding is consistent with the argument of our theory that the sensitivity of industry-adjusted sales growth decreases as the industry leverage level increases. In order to verify that this empirical result always holds whatever criteria we use to separate industry groups, we use alternative cut-offs to classify industry debt groups.

When we split the industries into bottom 2 vs. top 2 deciles and bottom 3 vs. top 3 deciles, the same pattern is observed again. The result is reported in column 5-10 of Table 3. In the bottom 2 vs. top 2 deciles division, the absolute value of coefficient decreases from 0.1008 to 0.0475, and become non-significant in the high-leverage group. In the bottom 3 vs. top 3 division, when moving from the low-leverage group to high-leverage group, we also notice a significant decrease in the sensitivity of industry-adjusted sales growth.

### 4.4.2 Manufacturing industries only

In most of the capital structure literatures, the sample is limited in manufacturing industry only. The reason is that companies in other industries, for example the financial industry, vary a lot in the business model and leverage level. In this part we classify industries according to CSRC's industry classification standard and restrict the analysis to firms operating in the C0-C99 range (manufacturing). Other selection criterias are the same as the baseline model.

The estimation result in Table 4 column 1 suggests that when including all the controlling variables, the sales of a firm with a leverage ratio 10 percent above its industry average before the recession is expected to grow nearly 0.4 percent less than its rivals in each quarter during the recession period. The coefficient for leverage equals to -0.0397, which is more close to the -0.0373 estimation in Campello and Fluck (2006), which employs data of firms operating in the 200-399 SIC range (manufacturing). In the remaining part of table 4, we estimate various version of the

baseline model to assess the impact of control variables on the leverage coefficient. We notice that in all cases the leverage coefficient remains significantly less than zero and the magnitude is relatively stable.

We also repeat the test for *hypothesis 2* using the manufacturing industries sample. Under the Bottom 2 vs. Top 2 Decile cut-off, the coefficient for leverage equals to -0.1479 in industries where low debt is the norm. The magnitude of the coefficient decreases quickly when we move to industries with higher average leverage level. Actually in the medium and top 2 deciles, the coefficient is non-significant. The result is consistent with the implication of our theory and the empirical outcome of the baseline model.

### 4.4.3 Alternative model specification

In this part we show that the empirical result we have identified in the baseline model is robust to various alternative model specifications. In column 2-5 of table 2, we estimate various version of the baseline model to assess the impact of PPE and total asset on the leverage coefficient. We notice that in all cases the leverage coefficient remains significantly less than zero and the magnitude is relatively stable. In column 5, we estimate a model where the only regressor is leverage. Compared with the baseline model, it is slightly less negative but still significantly different from zero.

In table 5 we adopt the model specification in Campello and Fluck (2006). We control in the regression analysis for possible firm-specific characteristics contributing to performance in the long-run by including lags of sales growth. A

similar coefficient for leverage is returned. In the remaining part of table 5, we exclude several controlling variables. While the leverage coefficient is more negative without inclusion of lagged sales growth and lagged asset growth (column 2, 4, and 5; Table 5), it is slightly less negative but still statistically different from zero without controlling for lagged PPE (column 3, Table 5). The reason that the exclusion of lagged PPE helps return larger coefficients for leverage both in table 2 and table 5 may be that investment spending may have been financed with debt and it helps control for the underlying positive correlation between debt and performance.

In a word, our results that leverage has negative impact on the industry-adjusted market performance during recession holds under various alternative model specifications.

## 4.5 Conclusion

In this chapter we examine the impact of leverage on firm's product market performance using both firm and industry level information during 2007-08 recession. Regression analysis shows that the pre-existing debt burden has negative effect on firm's market share growth during recession, and the magnitude of this effect is determined by the industry characteristics. Specifically, if the company operates in an industry where low leverage is prevailing, it will be impacted more seriously by the debt burden. On contrary, if the company operates in a high leveraged industry, the negative impact of debt burden becomes not so significant.

# Chapter 5 Does the ownership structure matter: The state shareholding and firm performance

In this section we examine the impact of ownership structure on firm's product market performance during recession. Growing in a transition economy, Chinese companies have several distinguishing features in the ownership structure compared with those in the developed countries and other developing countries. First, in the Anglo-American model, share ownership is dispersed, while in the German-Japanese model which China adopt, core investors own significant stakes. Second, the privatization of Chinese SOE follows a gradual process (Qian et al., 1999), and in most publicly listed companies, state-owned shares still account for a large proportion. Third, in China the major source of debt financing is bank loans, and a very interesting phenomenon is that both of the debtor and the creditor may be state-owned enterprises. These characteristics require further investigation of the Chinese story.

## 5.1 Literature and hypothesis

Traditionally state ownership is viewed as inefficient and even detrimental. First, because the well being of government officers is not tied to the performance of state-owned listed firms, they are not adequately motivated to monitor and improve company's performance. Second, the goal of government is to maximize social welfare rather than maximize firm's profit. Government usually require SOEs to take on social responsibility such as hiring unnecessary labors to increase employment

rate, or maintaining the stability of sale price, which distorts firm's behavior in the market(Vickers and Yarrow, 1988). Third, the widespread corruption phenomenon in government further exacerbates the problem. Politicians may transfer resources of firms to their political supporters (Shleifer and Vishny 1998), which normally are at the expense of corporate profitability (Shapiro and Willig, 1992; Boycko et al. 1996).

The majority of empirical research supports that state ownership is detrimental to firm value. Megginston et al. (1994) compare corporate performance before and after privatization and find that the decrease of state ownership improves corporate performance. However, there are also some contradictory evidences. For example, Tian (2001) documents that the impact of state ownership on firm's value is a U-shape curve. That is the corporate value is lower with a larger stake of government ownership when the government is a small shareholder, but it increases with increased state shareholding when the government is a large shareholder. He argues that it is because the government turns from a grabbing hand to a helping hand with the increase of stakes.

This paper tries to look at the role of government ownership from a different aspect. Besides analyzing the direct interaction between state shareholder and firms, we mainly focus on the implicit effect of state shareholding on firm, its industry peers and customers. The story is as follows. In view of social and economic benefit, the government is reluctant to see SOEs going bankruptcy. Because the creditors are state-owned banks, the state-owned leveraged companies may not have to pay back all the debt and they can borrow as much as possible without worry about financial

constraint or bankruptcy (Kornai, 1980), which is called "soft budget constraint". As a result, in the competitive product market, a leveraged SOE is less likely to suffer from predatory action of rivals, which decreases the probability of liquidation.

## 5.2 Shareholding structure of Chinese listed firms

In China shares are classified into four categories, A-share, B-share, H-share and N-share. Among the four types only the A-shares are held by domestic investors. B-shares are sold only to foreign investors. The H-share and N-share are listed in Hong Kong Stock Exchange and New York Stock Exchange, respectively. Because B-, H- and N-shares are denominated in foreign currencies and reserved exclusively for foreign investors, most of whom are passive investors (Qi, 2000), we define them as Foreign Shares.

A-share could be further divided into four classes according to holder's nature. The State Shares are held by the central government, local government, or solely state-owned enterprises. The Legal Person Shares are owned by institutional investors including stock companies, financial institutions other than banks, and SOEs that have at least one non-state owner. The Tradable A-shares is the only type of equity that could be traded freely in the stock exchange, and they are held and traded mostly by individual investors. We use Other Shares to denote the remaining shares, including shares offered to employees and managers.

As shown in table 6, a typical listed Chinese company has a mixed ownership consisting of three groups of shareholders—the state, the legal persons, and domestic

individual investors. On average the state holds a stake of 25.9%, the legal person as a whole accounts for 15.5%, and the tradable A-share takes 53.4%. The statistic report as of the end of 2007 differs a lot from Qi (2000), in which the state, legal persons and individual investors of tradable A-shares each account for about one third of total shares outstanding, respectively. The sharp increase of tradable A-share is natural that China has carried out the Non-tradable Shares Reform since 2005. Table 6 also reports ownership structure of listed companies in 2007 by industries. The result is reported in descending order of state shareholding ratio. The state holds a large stake in mineral industry (B01, 46.2%) and utility industry (D01, 40.2%), and lowest in retail industry (H11, 17.2%), textile industry (C13, 15.2%) and plastics manufacturing industry (C49, 11.7%), while the proportion of legal person share is just the opposite. and This reflects the Chinese government's policy of controlling the important natural resources and heavy investment in infrastructure project. The averages of foreign and other are less than 10% in all the 35 industries. Because most listed companies do not have foreign and other classes of shares, we focus on the effects of state, legal person and tradable A-share on corporate performance in this paper.

Another feature of Chinese companies is the highly concentrated ownership structure. Xu and Wang (1999) shows that in 1995 the five largest shareholders accounted 58% of the outstanding shares in China, compared with 57.8% in the Czech Republic, 79% in Germany, and 33% in Japan. However, we will not explore this feature here.

## 5.3 Empirical findings

To examine hypothesis 3, we need to compare the product market performance of state-owned enterprises and non-state-owned enterprises. The method is to introduce variable denoting state ownership and its interaction with leverage into the baseline model. We use three alternative ways to classify state-owned enterprises and non-state-owned enterprises: 1) mixed enterprises and private enterprises. The private enterprises are defined as companies without state shares. The enterprises with state shareholding more than 0% but less than 100% are grouped as the mixed enterprises; 2) firms where the government is the largest shareholder and firms whose largest shareholder is non-government entity. By saying largest shareholder, we mean that the proportion of state shareholding is greater than all of the other four categories; 3) firms where the government is the majority shareholder and firms whose majority shareholder is non-government entity. Holding more than 50% shares, the majority shareholder has the absolute control.

Then we obtain three dummy variables *mix*, *largest* and *majority*. The value of *mix* equals to one if the company is a mixed enterprises, otherwise it equals to 0. If the government is the largest shareholder, the value of *largest* equals to 1, otherwise 0. If the government is the majority shareholder, the value of *majority* equals to 1, otherwise 0. From mix enterprises to firms where state is the majority shareholder, the average degree of state ownership increases.

Table 7 shows that when we introduce mix to the baseline model, the coefficient is non-significant. But the interaction of mix and leverage returns a significant positive

coefficient 0.0631. This finding confirms that during recession, the financial constrained company will suffer less if it has government background. Suppose a firm's leverage ratio is 10 percent higher than industry average, its sales growth rate will be 0.98 percent lower than industry peers if it is a private-owned firm (column 2, table 7), while only 0.35 (that is "(-0.0981+0.0631)*10") percent lower if it is a mix enterprise. The result is consistent with the theory prediction that state shareholder will help leveraged firm during recession so that the company can survive in the second period, thus the company has the incentive to maintain the market share and the customers will not switch to other suppliers.

The same pattern is observed again when we include largest in the baseline model. The cross-term of largest and leverage has a coefficient equals to 0.1 and is significant at 5% level. Suppose a firm's leverage ratio is 10 percent higher than industry average, its sales growth rate will be 0.764 percent lower than industry peers if government is not the largest shareholder (column 4, table 7), while it could even gain a more rapid growth rate 0.236 (that is "(-0.0764+0.1)*10") percent higher if state holds more shares than other equity holders.

The empirical finding strongly support hypothesis 3a that the state ownership of companies has a positive contribution to the firm market share when they adopt higher degrees of leverage than industry average. The performance of state-owned leveraged firms far exceeds those without state shareholder. This implies that for high leveraged firms, state shareholder tends to act as a helping hand. Further, we prove hypothesis 3b that with the growth of state ownership, its positive effect on

financial constrained firms during recession becomes more significant. The reason might be that comparing with firms where state is only a small shareholder, the firms with state as the largest shareholder usually have closer relationship with the government and thus the ability to obtain more preferential policies.

However, one confusing thing presented in Table 7 is that the coefficient of $majority \times leverage$ is non-significant when state holds more than 50% shares (column 3, table 7). We propose that when state has the absolute control, it probably tends from a helping hand to a grasping hand because no one can restrict its behavior. This result is kind of different from Tian (2001), who finds that when the proportion of state shares exceeds 40%, the corporate value begins to increase, while when the proportion of state shares is lower than 40%, the corporate value decreases with the growth of state shares ( the "U-shape").

# Chapter 6 Conclusion

This paper studies the implication of financial structures and state ownership on firms' product market behavior. We develop a theoretical model in which two firms with different debt level, consumers facing switching cost and the state shareholder operate together, to determine the product price and market share of each company. We present four theoretical predictions on the interaction between financial structure, state ownership, and firm's product market performance.

Consistent with these predictions, using data of Chinese listed firms over the 2007-08 recession, we provide evidence that the firm with higher leverage than industry peers tends to loss larger market shares when there is a negative shock to the economy. We also find that the negative effect of debt burden is stronger for firms that operate in industries with low debt level. Additionally, we show that for state-owned firms the market share losses during recession is less significant than a private firm with similar leverage level. Finally, we show that when the proportion of state shares is lower than 50%, its benefit increases, while when the proportion of state shares exceeds 50%, state ownership is less helpful in preventing leveraged firm from losing market share during recession.

Our paper adds to the theoretical literature on the interaction of financial leverage and product market performance. The innovation of this paper is to introduce state shareholder into the traditional framework composed of consumers, company, and industry rival. As far as we know, none of the existing literatures have analyzed these factors simultaneously. The empirical evidence of this paper adds to

previous literature by showing the consistent results using Chinese data. Further, our paper is the first attempt to exam the beneficial effect of state ownership for high leverage companies during recession.

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Figure 1 Tightening monetary policy in 2007-08

This figure shows the Chinese lending rates on less than 3-year loan and the deposits rate on 3-year deposit. Series are gathered from the People's Bank of China and *China Data Online* database.

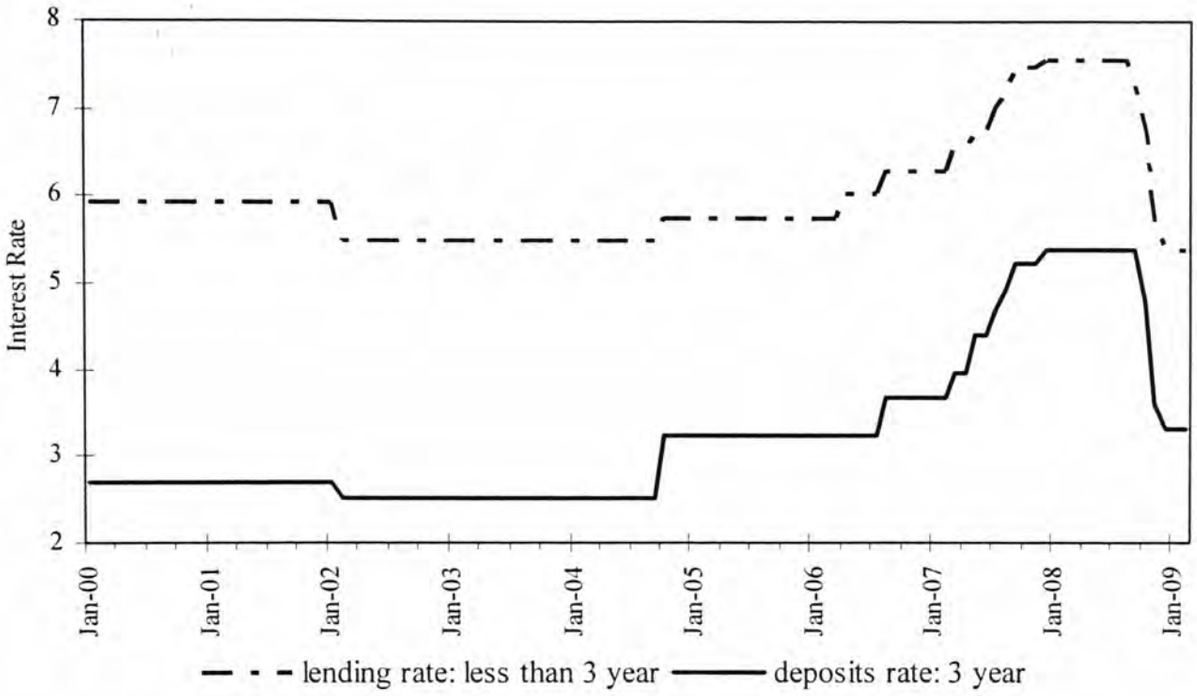


Figure 2 Decreasing Gross Domestic Product in 2007-08

This Figure displays the series for total industrial production in the form of GDP (Gross Domestic Product). The indices of GDP is measured at constant price.

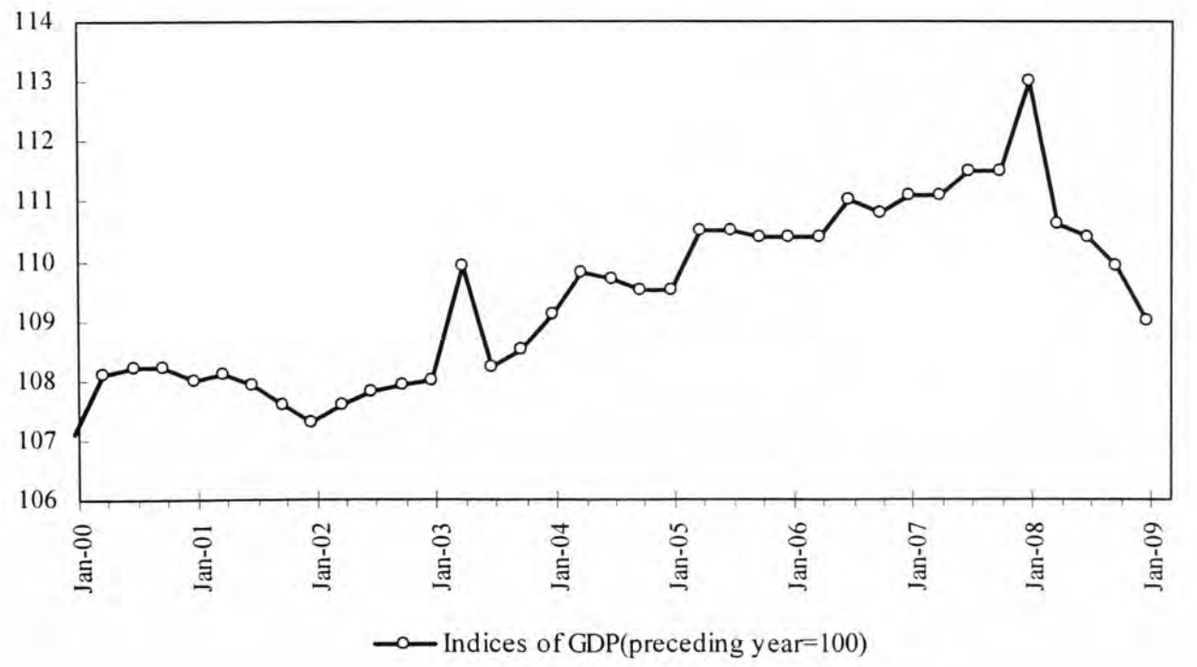

Table 1 summary statistics

Industries are defined according to CSRC's industry classification standard. Only industries with a minimum of ten firms are kept in the sample. The leverage is defined as the ratio of total debt to total asset in 2007: IV (the quarter before the recession starts). The quarterly sales growth rate is computed as [*Log* (*Sales*) $_{2007:\ IV}$ – *Log* (*Sales*) $_{2008:\ III}$]/3. The industry mean of leverage and sales growth rate are asset-weighted and sales-weighted respectively.

| Industry Code | Industry description | Number of observations | Industry asset-weighted leverage | Industry sales-weighted growth rate |
|---|---|---|---|---|
| A01 | Agriculture | 17 | 0.58 | -0.08 |
| B01 | Coal mining and dressing | 17 | 0.47 | 0.08 |
| C01 | Food processing | 23 | 0.47 | -0.01 |
| C05 | Beverage manufacturing | 25 | 0.39 | 0.00 |
| C11 | Textile | 43 | 0.55 | -0.12 |
| C13 | Manufacturers of clothes and other fiber products | 18 | 0.54 | -0.01 |
| C31 | Paper making and paper products | 24 | 0.57 | -0.02 |
| C41 | Oil processing and refining | 11 | 0.40 | 0.01 |
| C43 | Chemical material and products manufacturing | 91 | 0.53 | 0.01 |
| C47 | Chemical fibers Manufacturing | 17 | 0.42 | -0.02 |
| C49 | Plastic manufacturing | 14 | 0.56 | 0.02 |
| C51 | Electronic parts and components manufacturing | 30 | 0.44 | -0.02 |
| C55 | Daily use electronic equipment manufacturing | 13 | 0.59 | -0.01 |
| C61 | Non-metal mineral products | 52 | 0.58 | 0.00 |
| C65 | Ferrous metal foundries and presses | 30 | 0.56 | 0.04 |
| C67 | Non-ferrous metal foundries and presses | 26 | 0.57 | 0.01 |
| C69 | Metal products | 17 | 0.54 | 0.01 |
| C71 | Common machines manufacturing | 35 | 0.53 | -0.04 |
| C73 | Special equipment manufacturing | 48 | 0.58 | 0.00 |
| C75 | Traffic equipment manufacturing | 64 | 0.57 | -0.01 |
| C76 | Electric equipment and parts manufacturing | 45 | 0.66 | -0.04 |
| C78 | Instrument, meter, stationery and office machine | 11 | 0.53 | -0.09 |
| C81 | Medicine manufacturing | 72 | 0.49 | 0.00 |
| C99 | Other manufacturing | 19 | 0.53 | -0.01 |
| D01 | Electric power, gas and water production | 57 | 0.58 | 0.01 |
| E01 | Civil engineering works construction | 28 | 0.72 | -0.03 |
| F11 | Transportation subsidiary service | 33 | 0.40 | 0.00 |
| G81 | Communications and equipment manufacturing | 31 | 0.60 | -0.02 |
| G87 | Computer application service | 31 | 0.49 | -0.05 |
| H11 | Retail trade | 55 | 0.61 | -0.01 |
| H21 | Commercial brokerage and agency service | 19 | 0.67 | 0.01 |
| J01 | Real estate development and operation | 60 | 0.63 | -0.18 |
| K01 | Public facilities service | 14 | 0.50 | -0.05 |
| K34 | Travel industry | 14 | 0.48 | -0.05 |
| M | Comprehensive | 71 | 0.57 | -0.07 |
| Entire sample | 35 | 1175 | 0.56 | -0.01 |

Table 2 Regression analysis: The impact of capital structure on market performance

This table reports the regression results of the baseline model using pooled data. The dependent variable is quarterly sales growth rate which is computed as [*Log* (*Sales)* $_{2007:\ IV}$ – *Log* (*Sales*) $_{2008:\ III}$]/3. Leverage is computed as the debt-to-asset ratio using firm-level book data in 2007: IV and adjusted for industry asset-weighted mean.. The dependent variable is measured within the recession period (from 2007: IV to 2008: III) while the independent variables are calculated before the recession. All variables are adjusted according to industry means. Numbers within parentheses are p-values. Standard deviations are in the parenthesis. The asterisks behind the coefficient show the range of P-values: *** as p-value≤ 1 %, ** p-value≤ 5%, * p-value≤ 10%.

OLS estimation

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| $\eta$ | 0.0025 | 0.0027 | 0.0032 | 0.0030 |
| | (0.384 ) | (0.358 ) | (0.277 ) | (0.295 ) |
| $Leverage_{i,t-1}$ | **-0.0560*** ** | **-0.0500*** ** | **-0.0563*** ** | **-0.0504*** ** |
| | **(0.001 )** | **(0.003 )** | **(0.001 )** | **(0.003 )** |
| $\Delta Log(Assets)_{i,t-1}$ | -0.0060 | 0.0163 | | |
| | (0.799 ) | (0.431 ) | | |
| $\Delta Log(Assets)_{i,t-1}$ | 0.0335 | 0.0309 | | |
| | (0.177 ) | (0.144 ) | | |
| $\Delta Log(Assets)_{i,t-1}$ | **-0.0447** ** | **-0.0379* ** | | |
| | **(0.038 )** | **(0.079 )** | | |
| $\Delta Log(Assets)_{i,t-1}$ | **-0.0703*** ** | **-0.0493*** ** | | |
| | **(0.000 )** | **(0.000 )** | | |
| $\Delta Log(PPE)_{i,t-1}$ | 0.0035 | | 0.0035 | |
| | (0.607 ) | | (0.592 ) | |
| $\Delta Log(PPE)_{i,t-2}$ | 0.0069 | | 0.0110 | |
| | (0.597 ) | | (0.380 ) | |
| $\Delta Log(PPE)_{i,t-3}$ | **0.0427*** ** | | **0.0397*** ** | |
| | **(0.000 )** | | **(0.000 )** | |
| $\Delta Log(PPE)_{i,t-4}$ | **0.0330*** ** | | **0.0167** ** | |
| | **(0.000 )** | | **(0.044 )** | |
| $adj.R^2$ | 0.0413 | 0.0191 | 0.0194 | 0.0067 |
| sample size | 1,167 | 1,170 | 1,167 | 1,175 |

Table 3 Regression analysis: Sales-leverage sensitivity in different industry debt categories

This table reports changes in sales-leverage sensitivity for industry groups with different leverage level. Sample firms are ranked according to industry asset-weighted leverage in 2007: IV and then divided into deciles. In the first column the estimation of pooled data is presented again for comparison. In column 2 to 4, we separate firms in industries ranked in the bottom one decile (low-leverage group), those in the top one decile (high-leverage group), and the remaining firms (medium-leverage group). The baseline model is estimated based on these subsamples. In column 5 to 7 and column 8 to 9, we utilize different partition method to check the robustness of the conclusion. Standard deviations are in the parenthesis. The asterisks behind the coefficient show the range of P-values: *** as p-value≤ 1 %, ** p-value≤ 5%, * p-value≤ 10%.

OLS estimation

| Dependent variable: industry-adjusted quarterly sales growth in 2007-08 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pooled | Bottom 1 vs. Top 1 Decile | | | Bottom 2 vs. Top 2 Deciles | | | Bottom 3 vs. Top 3 Deciles | | |
| Column number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | | low | medium | high | low | medium | high | low | medium | high |
| $\eta$ | 0.0025 | -0.0106 | 0.0024 | 0.0139 | -0.0023 | 0.0041 | -0.0013 | -0.0018 | 0.0097** | -0.0038 |
| | (0.384 ) | (0.278 ) | (0.426 ) | (0.263 ) | (0.730 ) | (0.237 ) | (0.868 ) | (0.698 ) | **(0.035 )** | (0.491 ) |
| $Leverage_{i,t-1}$ | **-0.0560 *** ** | **-0.1219 ** ** | **-0.0492 *** ** | -0.0296 | **-0.1008** ** | **-0.0475** ** | -0.0506 | **-0.0618** ** | **-0.0510 * ** | **-0.0559* ** |
| | **(0.001 )** | **(0.031 )** | **(0.005 )** | (0.653 ) | **(0.014 )** | **(0.018 )** | (0.227 ) | **(0.015 )** | **(0.066 )** | **(0.072 )** |
| $\Delta Log(Assets)_{i,t-1}$ | -0.0060 | -0.1257 | -0.0335 | **0.1561*** | -0.0886 | -0.0304 | **0.1198 *** | -0.0669 | -0.0394 | 0.0218 |
| | (0.799 ) | (0.473 ) | (0.161 ) | **(0.066 )** | (0.328 ) | (0.253 ) | **(0.059 )** | (0.245 ) | (0.343 ) | (0.524 ) |
| $\Delta Log(Assets)_{i,t-2}$ | 0.0335 | 0.0245 | **0.0754 ** ** | -0.0532 | 0.0265 | **0.0758 ** ** | -0.0300 | 0.0190 | **0.1135 ** ** | -0.0289 |
| | (0.177 ) | (0.697 ) | **(0.014 )** | (0.533 ) | (0.557 ) | **(0.037 )** | (0.625 ) | (0.531 ) | **(0.025 )** | (0.573 ) |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $\Delta Log(Assets)_{i,t-3}$ | **-0.0447 **** | 0.2280 | -0.0138 | **-0.2209 ***** | 0.0471 | -0.0129 | **-0.2034 ***** | -0.0345 | -0.0409 | **-0.0533*** |
| | **(0.038 )** | (0.107 ) | (0.539 ) | **(0.002 )** | (0.562 ) | (0.601 ) | **(0.000 )** | (0.518 ) | (0.269 ) | **(0.097 )** |
| $\Delta Log(Assets)_{i,t-4}$ | **-0.0703 ***** | **-0.2669***** | **-0.0439***** | -0.0372 | **-0.2155 ***** | **-0.0524***** | -0.0388 | **-0.1586***** | -0.0090 | **-0.0993 ***** |
| | **(0.000 )** | **(0.000 )** | **(0.004 )** | (0.497 ) | **(0.000 )** | **(0.002 )** | (0.280 ) | **(0.000 )** | (0.697 ) | **(0.000 )** |
| $\Delta Log(PPE)_{i,t-1}$ | 0.0035 | 0.0898 | 0.0093 | -0.0071 | **0.1060 *** | -0.0008 | 0.0015 | 0.0185 | -0.0091 | 0.0088 |
| | (0.607 ) | (0.203 ) | (0.313 ) | (0.596 ) | **(0.020 )** | (0.943 ) | (0.885 ) | (0.322 ) | (0.495 ) | (0.349 ) |
| $\Delta Log(PPE)_{i,t-2}$ | 0.0069 | 0.0430 | -0.0052 | 0.0397 | 0.0106 | -0.0028 | 0.0381 | -0.0037 | 0.0070 | **0.0395*** |
| | (0.597 ) | (0.591 ) | (0.717 ) | (0.259 ) | (0.852 ) | (0.861 ) | (0.163 ) | (0.889 ) | (0.737 ) | **(0.079 )** |
| $\Delta Log(PPE)_{i,t-3}$ | **0.0427 ***** | 0.1237 | **0.0480***** | 0.0054 | 0.0187 | **0.0492 ***** | 0.0051 | 0.0234 | **0.0780 ***** | **0.0240 *** |
| | **(0.000 )** | (0.235 ) | **(0.000 )** | (0.835 ) | (0.751 ) | **(0.000 )** | (0.809 ) | (0.482 ) | **(0.000 )** | **(0.092 )** |
| $\Delta Log(PPE)_{i,t-4}$ | **0.0330 ***** | **0.1618 ***** | **0.0266*** | 0.0001 | **0.0980 ***** | **0.0338 ***** | 0.0020 | **0.0880***** | 0.0047 | **0.0281 *** |
| | **(0.000 )** | **(0.001 )** | **(0.014 )** | (0.996 ) | **(0.000 )** | **(0.009 )** | (0.896 ) | **(0.000 )** | (0.783 ) | **(0.028 )** |
| $adj.R^2$ | 0.0413 | 0.3567 | 0.0378 | 0.0481 | 0.2324 | 0.0398 | 0.0563 | 0.1342 | 0.0400 | 0.0512 |
| sample size | 1,167 | 86 | 930 | 151 | 156 | 761 | 250 | 272 | 472 | 423 |

Table 4 Robust test: The impact of capital structure on market performance (manufacturing only)

This table reports the regression results of the baseline model using manufacturing industry pooled data (C0-C99 according to CSRC's industry classification standard). The dependent variable is quarterly sales growth rate which is computed as [*Log (Sales)* $_{2007: IV}$ – *Log (Sales)* $_{2008: III}$]/3. Leverage is computed as the debt-to-asset ratio using firm-level book data in 2007: IV and adjusted for industry asset-weighted mean.. The dependent variable is measured within the recession period (from 2007: IV to 2008: III) while the independent variables are calculated before the recession. All variables are adjusted according to industry means. Numbers within parentheses are p-values. Standard deviations are in the parenthesis. The asterisks behind the coefficient show the range of P-values: *** as p-value≤ 1 %, ** p-value≤ 5%, * p-value≤ 10%.

OLS estimation

| | | | | | Bottom 2 vs. Top 2 Decile | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | Low | Medium | high |
| $\eta$ | 0.0042 | 0.0045 | 0.0045 | 0.0046 | -0.0018 | **0.0091**** | -0.0004 |
| | (0.174 ) | (0.159 ) | (0.157 ) | (0.159 ) | (0.857 ) | **(0.025 )** | (0.947 ) |
| $Leverage_{i,t-1}$ | **-0.0397 **** | **-0.0375 **** | **-0.0397 **** | **-0.0365 *** | **-0.1479**** | -0.0271 | -0.0043 |
| | **(0.029 )** | **(0.045 )** | **(0.033 )** | **(0.053 )** | **(0.023 )** | (0.260 ) | (0.886 ) |
| $\Delta Log(Assets)_{i,t-1}$ | **-0.0573 *** | 0.0216 | | | -0.0650 | -0.0670 | -0.0371 |
| | **(0.052 )** | (0.361 ) | | | (0.654 ) | (0.110 ) | (0.360 ) |
| $\Delta Log(Assets)_{i,t-1}$ | **0.0536 **** | **0.0414 *** | | | 0.0279 | **0.1162**** | 0.0870 |
| | **(0.046 )** | **(0.061 )** | | | (0.647 ) | **(0.019 )** | (0.101 ) |
| $\Delta Log(Assets)_{i,t-1}$ | -0.0169 | 0.0054 | | | 0.1735 | -0.0041 | -0.0136 |
| | (0.439 ) | (0.811 ) | | | (0.252 ) | (0.903 ) | (0.619 ) |
| $\Delta Log(Assets)_{i,t-1}$ | **-0.0874 **** | **-0.0549 **** | | | **-0.2668***** | -0.0117 | **-0.1410***** |
| | **(0.000 )** | **(0.000 )** | | | **(0.000 )** | (0.600 ) | **(0.000 )** |
| $\Delta Log(PPE)_{i,t-1}$ | **0.0461 **** | | **0.0319**** | | **0.1179*** | **0.0524**** | **0.0339*** |
| | **(0.003 )** | | **(0.025 )** | | **(0.071 )** | **(0.044 )** | **(0.077 )** |
| $\Delta Log(PPE)_{i,t-2}$ | 0.0131 | | 0.0212 | | 0.0245 | -0.0149 | **0.0595*** |
| | (0.460 ) | | (0.204 ) | | (0.776 ) | (0.554 ) | **(0.067 )** |
| $\Delta Log(PPE)_{i,t-3}$ | **0.0571 **** | | **0.0556*** | | 0.0160 | 0.0120 | **0.0687***** |
| | **(0.000 )** | | **(0.000 )** | | (0.828 ) | (0.667 ) | **(0.000 )** |
| $\Delta Log(PPE)_{i,t-4}$ | **0.0579 **** | | **0.0302 **** | | **0.1065***** | 0.0111 | **0.0409**** |
| | **(0.000 )** | | **(0.004 )** | | **(0.001 )** | (0.551 ) | **(0.019 )** |
| $adj.R^2$ | 0.0976 | 0.0236 | 0.0475 | 0.0038 | 0.3345 | 0.0140 | 0.2349 |
| sample size | 723 | 725 | 723 | 728 | 83 | 418 | 222 |

Table 5 Robust test: The impact of capital structure on market performance (control for past sales)

This table reports the regression results of the baseline model using pooled data. The dependent variable is quarterly sales growth rate which is computed as [*Log (Sales)* $_{2008: III}$ – *Log (Sales)* $_{2007:IV}$]/3. Leverage is computed as the debt-to-asset ratio using firm-level book data in 2007: IV and adjusted for industry asset-weighted mean.. The dependent variable is measured within the recession period (from 2007: IV to 2008: III) while the independent variables are calculated before the recession. All variables are adjusted according to industry means. Numbers within parentheses are p-values. Standard deviations are in the parenthesis. The asterisks behind the coefficient show the range of P-values: *** as p-value≤ 1 %, ** p-value≤ 5%, * p-value≤ 10%.

OLS estimations

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| $\eta$ | **0.0138*** ** | 0.0031 | **0.0130*** ** | **0.0140*** ** | 0.0030 |
| | **(0.000)** | (0.283) | **(0.000)** | **(0.000)** | (0.295) |
| $Leverage_{i,t-1}$ | **-0.0383*** ** | **-0.0560*** ** | **-0.0349** ** | **-0.0392*** ** | **-0.0504*** ** |
| | **(0.009)** | **(0.001)** | **(0.019)** | **(0.008)** | **(0.003)** |
| $\Delta Log(Sales)_{i,t-1}$ | -0.0005 | - | **0.0255** ** | **0.0213** ** | - |
| | (0.936) | - | **(0.016)** | **(0.047)** | - |
| $\Delta Log(Sales)_{i,t-2}$ | 0.0070 | - | **0.0373*** ** | **0.0257*** ** | - |
| | (0.520) | - | **(0.003)** | **(0.047)** | - |
| $\Delta Log(Sales)_{i,t-3}$ | 0.0163* | - | **-0.0652*** ** | **-0.0771*** ** | - |
| | (0.074) | - | **(0.000)** | **(0.000)** | - |
| $\Delta Log(Sales)_{i,t-4}$ | **0.0395*** ** | - | **-0.1567*** ** | **-0.1659*** ** | - |
| | **(0.000)** | - | **(0.000)** | **(0.000)** | - |
| $\Delta Log(PPE)_{i,t-1}$ | **0.0246** ** | 0.0048 | - | -0.0033 | - |
| | **(0.024)** | (0.485) | - | (0.570) | - |
| $\Delta Log(PPE)_{i,t-2}$ | **0.0269** ** | 0.0113 | - | 0.0062 | - |
| | **(0.037)** | (0.364) | - | (0.569) | - |
| $\Delta Log(PPE)_{i,t-3}$ | **-0.0767*** ** | **0.0400*** ** | - | **0.0157*** | - |
| | **(0.000)** | **(0.000)** | - | **(0.087)** | - |
| $\Delta Log(PPE)_{i,t-4}$ | **-0.1653*** ** | **0.0169** ** | - | **0.0392*** ** | - |
| | **(0.000)** | **(0.042)** | - | **(0.000)** | - |
| $\Delta Log(Assets)_{i,t-1}$ | **-0.0345*** | -0.0145 | -0.0146 | - | - |
| | **(0.096)** | (0.540) | 0.401 | - | - |
| $adj.R^2$ | 0.2769 | 0.0188 | 0.2576 | 0.2758 | 0.0067 |
| sample size | 1156 | 1167 | 1159 | 1156 | 1175 |

Table 6 Summary statistics of ownership structure

This table summarizes the shareholding structure of Chinese listed firms. Common shares are divided into five groups, State, Legal person, A-share, Foreign and Other. The numbers in the cells are calculated as the ratio of the corresponding class of shares over total shares. The sum of numbers in the same row equals to one. In the last row we report the shareholding structure of all sample firms on average. It is based on the 2007 data for 1175 companies

| Industry Code | Industry Description | State | Legal person | A share | Foreign | Other |
|---|---|---|---|---|---|---|
| B01 | coalmining and dressing | 0.46 | 0.08 | 0.41 | 0.05 | 0.00 |
| C65 | Ferrous metal foundries and presses | 0.46 | 0.08 | 0.45 | 0.02 | 0.00 |
| F11 | Transportation subsidiary service | 0.41 | 0.07 | 0.46 | 0.05 | 0.01 |
| D01 | Electric power, gas and water production | 0.40 | 0.05 | 0.51 | 0.03 | 0.00 |
| C71 | Common machines manufacturing | 0.36 | 0.09 | 0.48 | 0.07 | 0.00 |
| C67 | Non-ferrous metal foundries and presses | 0.36 | 0.10 | 0.48 | 0.02 | 0.05 |
| K01 | Public facilities service | 0.33 | 0.10 | 0.52 | 0.04 | 0.00 |
| C75 | Traffic equipment manufacturing | 0.33 | 0.12 | 0.49 | 0.04 | 0.01 |
| H21 | Commercial brokerage and agency service | 0.32 | 0.08 | 0.57 | 0.01 | 0.01 |
| E01 | Civil engineering works construction | 0.32 | 0.11 | 0.54 | 0.00 | 0.03 |
| A01 | Agriculture | 0.31 | 0.10 | 0.57 | 0.00 | 0.01 |
| C43 | Chemical material and products manufacturing | 0.31 | 0.11 | 0.55 | 0.01 | 0.02 |
| C73 | Special equipment manufacturing | 0.30 | 0.11 | 0.50 | 0.06 | 0.04 |
| K34 | Travel industry | 0.30 | 0.15 | 0.46 | 0.06 | 0.03 |
| C61 | Non-metal mineral products | 0.29 | 0.14 | 0.51 | 0.04 | 0.02 |
| C05 | Beverage manufacturing | 0.25 | 0.22 | 0.48 | 0.04 | 0.01 |
| C55 | Daily use electronic equipment manufacturing | 0.25 | 0.13 | 0.51 | 0.05 | 0.06 |
| C31 | Papermaking and paper products | 0.23 | 0.18 | 0.53 | 0.03 | 0.03 |
| C41 | Oil processing and refining | 0.23 | 0.27 | 0.44 | 0.03 | 0.04 |
| C51 | Electronic parts and components manufacturing | 0.22 | 0.21 | 0.51 | 0.04 | 0.02 |
| J01 | Real estate development and operation | 0.22 | 0.21 | 0.53 | 0.03 | 0.01 |
| G81 | Communications and equipment manufacturing | 0.21 | 0.13 | 0.57 | 0.04 | 0.05 |
| C47 | Chemical fibers Manufacturing | 0.20 | 0.16 | 0.56 | 0.04 | 0.03 |
| C01 | Food processing | 0.20 | 0.21 | 0.55 | 0.02 | 0.02 |
| C81 | Medicine manufacturing | 0.20 | 0.17 | 0.57 | 0.02 | 0.03 |
| C76 | Electric equipment and parts manufacturing | 0.17 | 0.20 | 0.53 | 0.08 | 0.02 |
| H11 | Retail trade | 0.17 | 0.16 | 0.64 | 0.02 | 0.01 |
| C11 | Textile | 0.17 | 0.21 | 0.54 | 0.04 | 0.05 |
| C99 | Other manufacturing | 0.17 | 0.28 | 0.51 | 0.03 | 0.02 |
| C78 | Instrument, meter, stationery and office machine | 0.15 | 0.24 | 0.56 | 0.05 | 0.00 |
| C13 | Manufacturers of clothes and other fiber products | 0.15 | 0.31 | 0.46 | 0.08 | 0.00 |
| M | Comprehensive | 0.14 | 0.21 | 0.64 | 0.00 | 0.00 |
| C69 | Metal products | 0.14 | 0.28 | 0.50 | 0.06 | 0.02 |
| G87 | Computer application service | 0.12 | 0.23 | 0.59 | 0.01 | 0.05 |
| C49 | Plastic manufacturing | 0.12 | 0.20 | 0.64 | 0.00 | 0.05 |
| Average | | 0.26 | 0.16 | 0.53 | 0.03 | 0.02 |

Table 7 Regression analysis: The interaction of state ownership and capital structure on market performance

This table reports the regressions of baseline model after introducing the variable which stands for the government shareholding.

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| $\eta$ | 0.0025 | 0.0032 | 0.0025 | 0.0028 |
| | (0.384 ) | (0.570 ) | (0.381 ) | (0.396 ) |
| $Leverage_{i,t-1}$ | **-0.0560*** ** | **-0.0981*** ** | **-0.0559*** ** | **-0.0764*** ** |
| | **(0.001 )** | **(0.001 )** | **(0.001 )** | **(0.000 )** |
| *largest* | | | | -0.0015 |
| | | | | (0.837 ) |
| $largest \times leverage$ | | | | **0.1000** ** |
| | | | | **(0.019 )** |
| *majority* | | | -0.0408 | |
| | | | (0.412 ) | |
| $majority \times leverage$ | | | -0.1966 | |
| | | | (0.462 ) | |
| *mix* | | -0.0013 | | |
| | | (0.844 ) | | |
| $mix \times leverage$ | | **0.0631*** | | |
| | | **(0.082 )** | | |
| $\Delta Log(Assets)_{i,t-1}$ | **-0.0703*** ** | **-0.0699*** ** | **-0.0703*** ** | **-0.0686*** ** |
| | **(0.000 )** | **(0.000 )** | **(0.000 )** | **(0.000 )** |
| $\Delta Log(Assets)_{i,t-2}$ | **-0.0447** ** | **-0.0446** ** | **-0.0444** ** | **-0.0419*** |
| | **(0.038 )** | **(0.038 )** | **(0.039 )** | **(0.053 )** |
| $\Delta Log(Assets)_{i,t-3}$ | 0.0335 | 0.0371 | 0.0335 | 0.0356 |
| | (0.177 ) | (0.136 ) | (0.177 ) | (0.152 ) |
| $\Delta Log(Assets)_{i,t-4}$ | -0.0060 | -0.0032 | -0.0059 | -0.0059 |
| | (0.799 ) | (0.894 ) | (0.803 ) | (0.804 ) |
| $\Delta Log(PPE)_{i,t-1}$ | 0.0035 | 0.0037 | 0.0035 | 0.0042 |
| | (0.607 ) | (0.590 ) | (0.615 ) | (0.545 ) |
| $\Delta Log(PPE)_{i,t-2}$ | 0.0069 | 0.0044 | 0.0074 | 0.0080 |
| | (0.597 ) | (0.733 ) | (0.570 ) | (0.540 ) |
| $\Delta Log(PPE)_{i,t-3}$ | **0.0427*** ** | **0.0430*** ** | **0.0429*** ** | **0.0431*** ** |
| | **(0.000 )** | **(0.000 )** | **(0.000 )** | **(0.000 )** |
| $\Delta Log(PPE)_{i,t-4}$ | **0.0330*** ** | **0.0323*** ** | **0.0330*** ** | **0.0332*** ** |
| | **(0.000 )** | **(0.000 )** | **(0.000 )** | **(0.000 )** |
| $adj.R^2$ | 0.0413 | 0.0426 | 0.0403 | 0.0449 |
| Sample size | 1,167 | 1,167 | 1,164 | 1,157 |